



Zoonotic & Environmentally Transmitted Diseases (ZED) Steering Committee

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Web Resources

IPM Program:

<http://www1.nrintra.nps.gov/ipm/index.cfm>

Public Health:

http://www.nps.gov/public_health/intra/

Risk Management:

<http://www.nps.gov/riskmgmt/>

Wildlife Health:

<http://www1.nrintra.nps.gov/BRMD/nativespecies/wildlifehealth/index.htm>

CDC:

<http://www.cdc.gov/>

State and Local Health Departments:

<http://www.cdc.gov/mmwr/international/relres.html>

Hantavirus Risk Reduction General Principles

This document summarizes the updated recommendations from the Centers for Disease Control and Prevention (CDC) for rodent control in and around homes and workplaces. The information is adapted from the Morbidity and Mortality Weekly Report, July 26, 2002; Vol. 51; No. RR09.

Rodent control in and around buildings remains the primary strategy in preventing hantavirus infection. Rodent infestation can be determined by direct observation of animals, or inferred by observation of their nests or feces on floors or in protected areas (e.g., closets, kitchen cabinets, drawers, wall voids, furnace and water heater cabinets, behind ventilation screens), or from evidence that rodents have been gnawing on food or other objects. The interiors and exteriors of all buildings should be carefully inspected at least twice a year for any openings where rodents could enter and for conditions that could support rodent activity. If any evidence of rodent infestation is detected inside the buildings, precautions should be taken. The guidelines in the "Worker Protection" section should be followed if a building is associated with a confirmed case of hantavirus disease or if evidence of heavy rodent infestation is present (e.g., piles of feces or numerous nests or dead rodents).

Consult an NPS Integrated Pest Management (IPM) Coordinator for assistance with severe or persistent infestations. Recommended control measures include rodent-habitat elimination, rodent proofing, good sanitation practices, and trapping. Your IPM Coordinator can help you establish a comprehensive rodent management strategy.

Preventing Rodents from Entering Buildings by Rodent-proofing

- Look for and seal up all gaps and holes inside and outside the building that are $\geq \frac{1}{4}$ -inch (≥ 6 mm) in diameter. Inside the structure, look for and seal up all gaps and holes underneath, behind, and inside kitchen cabinets; inside closets; around floor air vents and dryer vents; around the fireplace; around windows and doors; behind appliances (e.g., dishwashers, clothes washers, and stoves); around pipes under the kitchen and bathroom sinks; around all electrical, water, gas, and sewer lines (chases); and beneath or behind water heaters, radiators, and furnaces and around their pipes that enter the building. Outside the building, look for and seal all gaps and holes around windows and doors; between the foundation of the structure and the ground; under doors without thresholds, door sweeps, or weatherstripping; around electrical, water, gas, and sewer lines (chases); and around the roof, eaves, gables, and soffits. In addition, look for unscreened attic vents and crawlspace vents. In trailers, look for and seal holes and gaps in the skirting, between the trim and metal siding, around utility lines and pipes and ducts, around roof vents, and around the trailer

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- Seal all entry holes $\geq\frac{1}{4}$ -inch (≥ 6 mm) in diameter that are inside and outside the building with any of the following: cement, lath screen or lath metal, wire screening, hardware cloth ($<\frac{1}{4}$ -inch grate size), steel wool, STUF-FIT* or other patching materials. Caulk and expanding foam can be used to reinforce any repairs where lath metal, hardware cloth, steel wool, or STUF-FIT are the primary materials. Expanding foam alone is effective about 90% of the time.
 - If rodent burrows are found under foundations or trailer skirtings, construct a barrier around the entire foundation using 14-inch-wide (35 cm), $\leq\frac{1}{4}$ -inch (≤ 6 mm) mesh, 16-19 gauge hardware cloth. Bend the hardware cloth lengthwise into a right angle, with two sides of approximately 7 inches (18 cm). Secure one side of the hardware cloth tightly to the building siding. The other side should be buried at least 2 inches (5 cm) below ground level and extend away from the wall.

Additional information is available in the NPS guide for rodent proofing structures (Mechanical Rodent Proofing Techniques). The entire document can be accessed at http://www.nps.gov/public_health/inter/info/general/rpmanual.pdf.

Precautions for the Outsides of Buildings

- Place woodpiles and stacks of lumber, bricks, stones, or other materials ≥ 100 feet from buildings.
- Store grains and animal feed in rodent-proof containers.
- Remove, from the vicinity of buildings any food sources that might attract rodents.
- Keep pet food covered and stored in rodent-proof containers. Allow outdoor pets only enough food for each meal, then store or discard any remaining food from feeding dishes.
- Avoid using bird feeders near buildings. If they must be placed near the building, use "squirrel-proof" feeders and clean up spilled seeds each evening.
- Dispose of garbage and trash in rodent-proof containers with tight-fitting lids.
- Haul away trash, abandoned vehicles, discarded tires, and other items that might serve as rodent nesting sites.
- Mow grass closely, and cut or remove brush and dense shrubbery to a distance of at least 100 feet from structures. Trim the limbs off any trees or shrubs that overhang or touch the building.
- Use concrete foundations in new construction of sheds, barns, and outbuildings. The top of the foundation should be at least 6 inches above ground level.
- Place spring-loaded snap traps in outbuildings and in areas that might likely serve as rodent shelter, within 100 feet around buildings; use these traps continuously, replacing the bait periodically. For instructions concerning the safe use and cleaning of spring-loaded snap traps and the disposal of trapped rodents, see "Precautions for Inside of Buildings," below.

Precautions for the Insides of Buildings

- Keep food and water covered and stored in rodent-proof containers.
- Keep pet food covered and stored in rodent-proof containers. Allow pets only enough food for each meal, then store or discard any remaining food. Do not leave excess pet food or water out overnight.
- If storing trash and food waste inside, do so in rodent-proof containers, and frequently clean the inside and outside of the containers with soap and water.
- Wash dishes, pans, and cooking utensils immediately after use.
- Remove leftover food and clean up all spilled food from cooking and eating areas.
- Clean empty aluminum cans or other empty containers prior to storage.
- Dispose of trash and garbage on a frequent and regular basis, and pick up or eliminate clutter.
- Keep items (e.g., boxes, clothes, blankets) off of the floor to prevent rodents from nesting in them.
- Repair water leaks and prevent condensation from forming on cold water pipes by insulating them. Deny rodents access to moisture (e.g., mop closets, boiler rooms, catch basins under potted plants,

and areas around aquarium tanks). Useful indicators for the identification of sources of moisture are growth of mold, mildew, or other fungi inside buildings.

- Keep exterior doors and windows closed unless protected by tight-fitting metal screens.
- Use spring-loaded snap traps with a small amount (the size of a pea) of peanut butter as bait. Place the trap perpendicular to the baseboard or wall surface, with the end of the trap containing the bait closest to the baseboard or wall. Place traps in areas where rodents might be entering the building. Spring-loaded traps can be painful or even dangerous if they close on fingers; they should be handled with caution, and placed where children and pets cannot reach them. Live trapping or the use of sticky boards is not recommended.

In the western United States (west of the 100th meridian, a line from mid-Texas through mid-North Dakota), a risk of plague transmission to humans from fleas exists. Use insect repellent (containing N,N-diethyl-m-toluamide [DEET]) on clothing, socks, and hands to reduce the risk of flea bites when picking up dead rodents and traps. In cases of heavy rodent infestation in indoor spaces in the western United States, use an insecticide before trapping. Contact your NPS Public Health Consultant to find out if plague is a danger in the area, and, together with the IPM Specialist, for advice on appropriate flea-control methods. The use of repellents and insecticides must be reviewed and approved by the appropriate NPS IPM Specialist.

- Continue trapping for at least 1 additional week after the last rodent is caught. As a precaution against reinfestation, use several baited, spring-loaded traps inside the building at all times in locations where rodents are most likely to be found. The bait must be replaced occasionally to keep it fresh.
- Examine traps regularly. To dispose of traps or trapped animals, wear rubber, latex, vinyl, or nitrile gloves. Spray the dead rodent with a disinfectant or chlorine solution. Wait 10 minutes after thoroughly soaking the rodent to ensure deactivation of the virus, then either take it out of the trap by lifting the spring-loaded metal bar and letting the animal fall into a plastic bag or place the entire trap containing the dead rodent in a plastic bag and seal the bag. Place the rodent into a second plastic bag and seal it. Dispose of the rodent in the double bag by burning it or placing it in a covered trash can that is regularly emptied. Contact the state or local health department concerning other appropriate disposal methods.
- If the trap will be reused, decontaminate it by immersing and washing it in a disinfectant or chlorine solution and rinsing afterward.
- For severe or persistent infestations, contact an NPS IPM Specialist.

When resident mice are removed from buildings without measures to prevent reentry, they are replaced almost immediately by other mice from the outside. Therefore, indoor rodent-trapping will be unsuccessful in reducing rodent infestations without simultaneous efforts to rodent-proof permeable structures.

*STUF-FIT is a soft copper-mesh material that might be preferable to steel wool because it does not rust and is not easily pulled apart by rodents. It can be obtained from pest control supply houses or from Allen Special Products (telephone 800-848-6805).